



(51) International Patent Classification:

C01B 33/18 (2006.01) *A61K 9/52* (2006.01)
A61K 9/58 (2006.01) *C08K 3/36* (2006.01)

(21) International Application Number:

PCT/SG2010/000021

(22) International Filing Date:

25 January 2010 (25.01.2010)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/149,777 4 February 2009 (04.02.2009) US

(71) Applicant (for all designated States except US): **AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH** [SG/SG]; 1 Fusionopolis Way #20-10, Connexis, Singapore 138632 (SG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **LIU, Ye** [CN/SG]; Institute of Materials Research and Engineering, 3 Research Link, Singapore 117602 (SG). **WU, Decheng** [CN/SG]; Institute of Materials Research and Engineering, 3 Research Link, Singapore 117602 (SG).

(74) Agent: **SCHIWECK, Wolfram**; Viering, Jentschura & Partner LLP, P.O. Box 1088, Rochor Post Office, Rochor Road, Singapore 911833 (SG).

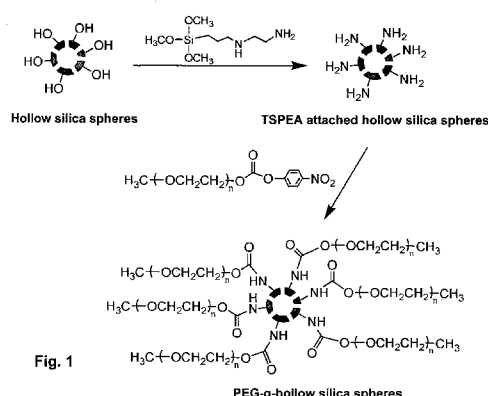
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: HOLLOW SILICA PARTICLE WITH A POLYMER THEREON



(57) Abstract: The present invention provides a hollow silica micro- or nanoparticle with a polymer immobilized thereon. The polymer is covalently linked to the silica particle via urethane groups. Provided is also a method of covalently coupling a polymer to a silica surface. The method comprises contacting a silica surface that carries amino functional groups with a polymer with a carbonate group of the general Formula (2). R² in Formula (2) is the polymer and R³ is one of an aliphatic, an alicyclic an aromatic and an arylaliphatic group or a silyl group with a main chain of about 1 to about 20 carbon atoms and 0 to about 6 heteroatoms selected from the group consisting of N, O, S, Se and Si. The method further comprises allowing the carbonate group of the polymer and an amino functional group on the silica surface to undergo a coupling reaction, thereby covalently coupling the polymer to the silica surface.